# Recent Life Prolonging Techniques in Wireless Sensor Network (WSN)

Pramodkumar H. Kulkarni[1], Samruddhi Palande[2], Devika Dhoke[3], Akshay Netkar[4]

[1]*Associate Professor, E&TC Dept. D.Y. Patil Institute of Technology, Pimpri, Pune-18*

[2, 3, 4] *UG Students, E&TC Dept. D.Y. Patil Institute of Technology, Pimpri, Pune-18*

**Abstract**: Wireless sensor network is ever-growing field in today's society. Smart homes with wirelessly connected and controllable devices, continuous monitoring in environmental, health care and industrial settings, and automated, self-adjusting systems in homes and factories are all growing technologies that are built using wireless sensor networks (WSNs). Based on network structure, routing protocols in WSNs can be divided into two categories: flat routing and clustering routing. As there are variety of advantages, clustering is becoming an active branch of routing technology in WSNs. Also wireless sensor network is an emerging technology that promises a wide range of potential applications in both civilian and military areas. In many of these systems, energy consumption can be a major concern. Most devices in the network rely on small batteries as their energy source. Because of this, any energy usage optimization can lead to greatly increased lifetime.

***Index Terms:*** Wireless Sensor Network, Energy, Clustering, Routing, Meta-heuristic, Optimization

**Introduction:**

Wireless Sensor Network (WSN) are highly distributed networks with micro–sensor nodes large numbers to handle more complex function [8]. The sensor nodes present in wireless sensor network communicate with each other and send the information to base station. Usually, the nodes are powered by limited batteries, so the purpose of extending the lifetime of WSN can be achieved by reducing the energy consumption. As an effective scheme to save energy consumption of WSN, a reasonable clustering routing protocol is generally divided into three phases: cluster setup phase, cluster heads (CHs) election phase, and data transmission phase. In the cluster setup phase, the sensor node groups in the detection area form clusters of different sizes [6]. Based on Particle Swarm Optimization (PSO), Ant Colony Optimization (ACO), Artificial Bee Colony (ABC), Penguin Search Optimization Algorithm (PeSOA), and Cat Swarm Optimization (CSO). Some nodes are selected as CHs election phase. Finally, in the data transmission phase, the member nodes are responsible for collecting environmental information and then transmitting it to the CHs. After the aggregation and data fusion, the CHs send it to the Base Station (BS) [6].

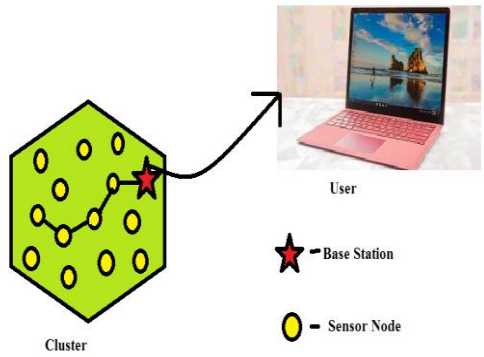


Figure1: Basic architecture of Wireless Sensor Network

There are the new technologies: -

1. **Particle Swarm Optimization (PSO) Algorithm**:

Particle Swarm Optimization (PSO) algorithm is used for solving nonlinear optimization problems. It is based on choreography of birds. The movements of the particles are accompany by their own best known position in the search-space and the entire swarm's on based best position [5]. When positions improved to discover these will come to help the movements of the swarm. The process is repeated by doing so it is anticipate, but it is not guaranteed, that a satisfactory solution will ultimately be discovered.

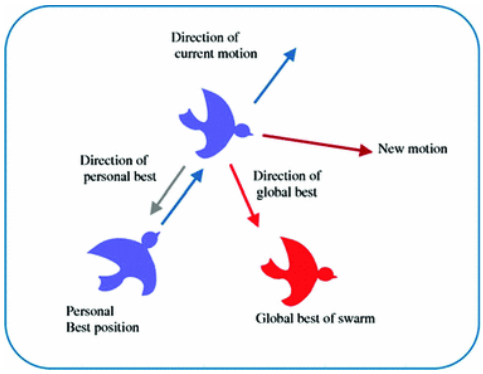


Figure 1.1 Representation of the elements of PSO

## 2. Ant Colony Optimization (ACO) Algorithm:

The Ant Colony Optimization (ACO) algorithm is a probabilistic technique for solving computational issue which can be reduced to detect good paths through graphs. Artificial ants stand for multi-agent methods to energize by behavior of real ants. Combinations of artificial ant and local search algorithms to become a method of possibility for various optimization task involve in some sort of graphs. Artificial ants located to optimal solution by moving through parameter space represents possible solutions.
Real ants lay down fragrances directed to each other towards resources while exploring their environment. This simulated ant record their position and quality of the solution such that in later simulations more ants locates better solutions. This will be similar to foraging patterns of honey bee. The first algorithm targeted to search for an optimal path in graph based on the behavior of seeking path between their colony and food source.

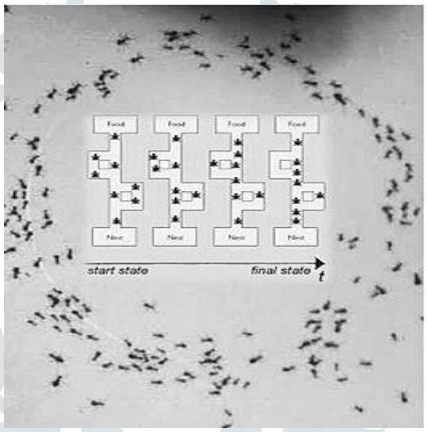


Figure 2.1 Representation of the elements of ACO

## 3. Artificial Bee Colony (ABC) Algorithm:

The Artificial Bee Colony (ABC) algorithm it is metaheuristic algorithm based on Swarm Optimization Algorithm which was introduced for optimization problems. It was inspired by the intellect foraging behavior of honey bees. The algorithm is specifically based on model proposed in the year 2005 for the foraging behavior of honey bee colonies [2]. The model consists of three vital components: food sources, employed and unemployed foraging bees. The employed and unemployed foraging bees components search for rich food sources, while the first component, close to their hive.

In ABC a colony of artificial forager bees search for rich artificial food sources i.e., better solution for a given problem. In this algorithm the considered problems is converted to the problem of finding the best parameters vector which reduces and objective function [7]. Then, the artificial honey bees randomly create a population of initial solution vectors and then improved them by employing the strategies i.e., moving towards better solutions by means of a neighbor search mechanism [2].

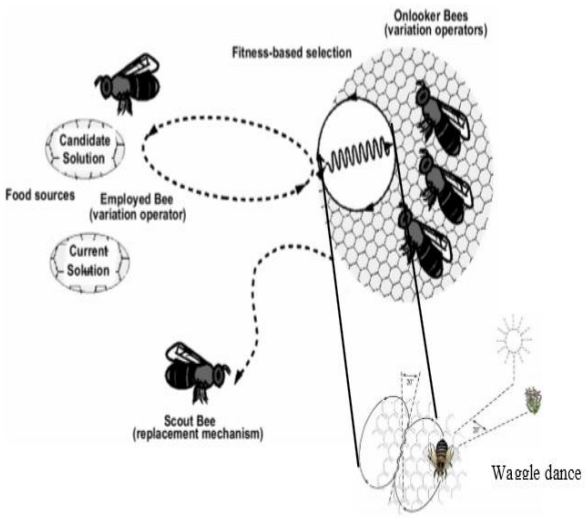


Figure 3.1: Representation of ABC algorithm

**4. Penguin Search Optimization (PeSOA) Algorithm:**

Penguins Search Optimization Algorithm (PeSOA): PeSOA algorithm is based on collaborative hunting strategy of penguins [1]. In few recent years, various effective methods based on cooperative strategies and inspired by nature have been proposed to solve np-hard problems in which, no solutions in polynomial time could be found. The global optimization process starts with single search process of each penguin, who must communicate to his respective group its position and the number of fish found to him. This cooperation aims to synchronize dives in order to achieve a global solution (place with high amounts of food). Distribution of penguins is based on probabilities of finding fish in both holes and levels. The penguins are divided into groups and begin searching in random positions [1]. After a fixed number of dives, the penguins back on the ice to share with its affiliate's depth and quantity of the food found i.e., number of fish found. The penguins of one or more groups with little food, follow at the next dive, the penguins who chased a lot of fish. The global solution is selected by election of the best group of penguins who ate the maximum fish from the pond. After describing the behavior of penguins, we present the formation of the algorithm before presenting the various tests with popular benchmarks. Comparative studies with other meta-heuristics have proved that PeSOA performs better as far as new optimization strategy of collaborative and progressive research of the space solutions.

5. **Cat Swarm Optimization (CSO) Algorithm:**

The Cat Swarm Optimization algorithm is similar to other Swarm optimization algorithm such as Particle Swarm Optimization algorithm and /or Ant Colony optimization algorithm. The Cat Swarm Optimization algorithm is inspired by behavior of cats which solves optimization issue. Searching and discovering, two common behavior of cats, two sub models of the algorithm are created. In searching mode it chooses several candidate points and then chooses one to move to randomly, increasing the probability of selecting points that have a higher fitness value [3]. Discovering mode is inspired by a cat discovering some targets. In this mode, the cat will try to move near the position with the best fitness value. It is used to reduce the energy consumption during cluster setup phase and transmission phase. It is used to develop by considering intra-cluster distance of nodes to CH (cluster head) and residual energy of cluster member nodes [4].

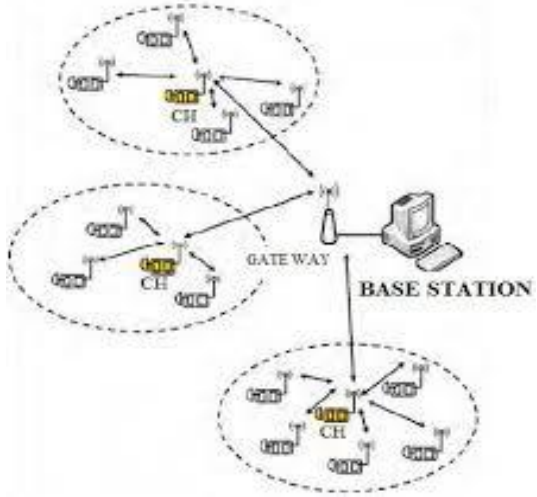


Figure 5.1 Representation of the elements of CSO

**Conclusion:**

Wireless Sensor Networks (WSNs) have attracted attention over the past few years, and can be employed in a wide spectrum of applications in both civilian and military scenarios. The design of effective and scalable routing protocols for WSNs is a challenging task. Still many researchers are working on energy efficiency where we can get optimal solution with minimum throughput. In this paper, we have presented a rather inclusive survey on clustering routing protocols in WSNs. We have systematically analyzed a few classical WSN routing protocols to design effective and efficient clustering for WSN.

**References**


1. Youcef GHERAIBIA and Abdelouahab MOUSSAOUL[2] – "Penguins Search Optimization Algorithm (PeSOA)"
2. 1.Tarun Kumar Sharma, 2.Millie Pant, 3V.P.Singh 1, 2 Indian Institute of Technology Roorkee, Roorkee, India SCET, Saharanpur, India – "Improved Local Search in Artificial Bee Colony using Golden Section Search"
3. Mahdi Bahrami, Omid Bozorg-Haddad and Xuefeng Chu - "Cat Swarm Optimization (CSO) Algorithm."
4. Xuxun Liu, "A Survey on Clustering Routing Protocols in Wireless Sensor Networks", School of Electronic and Information Engineering, South China University of Technology, Guangzhou 510641, China.
5. James Kennedy[1] and Russell Eberhart[2] Washington, DC 20212– "Particle Swarm Optimization".
6. Noor Zaman,[1] Low Tang Jung,[2] and Muhammad Mehboob Yasin[1,] "Enhancing Energy Efficiency of Wireless Sensor Network through the Design of Energy Efficient Routing Protocol", Journal of Sensors, Volume 2016.
7. Rajeev Kumar [1] . Dilip Kumar[2], "Multi-objective fractional artificial bee colony algorithm to energy aware routing protocol in wireless sensor network", Springer Science + Business Media New York 2015, doi: 10.1007/s11276-015-1039-4.
8. Najmeh Kamyab Pour: "Energy Efficiency in Wireless Sensor Networks" Book, December 2015.